I Claim:

1. A permutation switch for switching wavelength-division multiplexed signals received from one or more optical waveguides, comprising:

(a) a substrate having at least one surface;

(b) a single-mode to multi-mode backward coupler, coupled to said surface of said substrate, for receiving single-mode wavelength division multiplexed signals from said optical waveguides, and for backward coupling said signals into a plurality of single-mode signals, each having its own unique mode.

2. The switch of Claim 1, wherein said single-mode to multi-mode backward coupler further comprises:

(a) a receiving layer, coupled to said substrate surface, for receiving said single-mode wavelength-division multiplexed signals;

(b) a separation layer having a first surface and a second surface, said first surface coupled to said receiving layer, for permitting said backward coupling between said single-mode wavelength-division multiplexed signal and said plurality of single-mode signals; and;

(c) a multi-mode waveguide, coupled to said second surface of said separation layer, for receiving said backward coupled plurality of single-mode signals.

3. The switch of Claim 2, wherein said separation layer further comprises a grating portion etched into said second surface of said separation layer, for phase-

matching a channel of said wavelength-division multiplexed signal to one of said plurality of single-mode signals.

4. The switch of Claim 2, wherein said multi-mode waveguide further comprises a grating etched into a surface thereof for phase-matching a channel of said wavelength-division multiplexed signal to one of said plurality of single-mode signals, wherein said grating is coupled to said second surfaceof said separation layer.

5. The switch of Claim 2, wherein said wavelength division multiplexed signals comprise asynchronous signals.

6. The switch of Claim 2, wherein said single-mode signals comprise asynchronous signals.

7. The switch of Claim 2, wherein said separation layer is adapted to minimize a modal-field overlap.

8. The switch of Claim 2, wherein said single-mode to multi-mode backward coupler further comprises a plurality of output waveguides, each coupled to said multi-mode waveguide and receivingone of said plurality of single-mode signals.

9. The switch of Claim 8, wherein said plurality of output waveguides are distributed adiabatically.

10. The switch of Claim 2, wherein said receiving layer further includes an inverted rib portion having a predetermined width for propagating said single-mode wavelength division multiplexed signals.

11. The switch of Claim 10, wherein said multi-mode waveguide further includes a rib portion having a predetermined width, and wherein said predetermined width of said inverted rib of said receiving layer is less than said predetermined width of said rib of said multi-mode waveguide.

12. The switch of Claim 11, wherein said inverted rib portion of said receiving layer is offset from said rib portion of said mullti-mode waveguide.

13. The switch of Claim 11, wherein inverted rib portion of said receiving layer is alligned with an edge of said rib portion of said multi-mode waveguide.

14. The switch of Claim 2, wherein each of said output waveguides further includes a multiple-quantum well layer.

15. The switch of Claim 14, wherein said multiple quantum well layer comprises InGaAsP/InP.

16. The switch of Claim 8, further comprising a plurality of electrodes, each one mounted on one of said plurality of output waveguides.

17. The switch of Claim 16, wherein said plurality of electrodes are tapered.

18. The switch of Claim 14, wherein each of said plurality of output waveguides are sized to be much smaller than corresponding absorption lengths.

19. The switch of Claim 2, wherein said multi-mode layer is adapted to receive all of said backward coupled signals in sequential modes.

20. The switch of Claim 2, wherein said multi-mode waveguide is adapted to receive all of said backward coupled signals in even-ordered modes.

21. A method for switching wavelength-division multiplexed signals, comprising the steps of:

(a) receiving from one or more single-mode wavelength division multiplexed signals;

(b) backward coupling said received signals into a plurality of single-mode signals, each having its own unique mode; and

(c) switching said plurality of single-mode signals into separate channels.

22. The method of Claim 21, wherein said backward coupling further includes phase-matching a channel of said wavelength-division multiplexed signal to one of said plurality of single-mode signals.

23. The method of Claim 21, wherein said wavelength division multiplexed signals comprise asynchronous signals.

24. The method of Claim 21, wherein said single-mode signals comprise asynchronous signals.

25. The method of Claim 21, wherein said backward coupling is adapted to minimize a modal-field overlap.

26. The method of Claim 21, wherein said switching step comprises switching said plurality of single-mode signals into adiabatically distributed channels.

27. The method of Claim 21, wherein said backward coupling step further comprises propagating said single-mode wavelength division multiplexed signals in an inverted rib which is aligned with a rib of a multi-mode waveguide.

28. The method of Claim 21, wherein said backward coupling step is adapted to couple all of said backward coupled signals in sequential modes.

29. The method of Claim 21, wherein said backward coupling step is adapted to couple all of said backward coupled signals in even-ordered modes.

30. An add/drop multiplexer system for adding and dropping unequally spaced channels of a single-mode waveguide, comprising:

(a) a substrate having at least a first surface;

(b) a plurality of siongle-mode waveguides having unequally spaced channels mounted on said first surface;

(c) a common single-mode to multi-mode waveguide grating-assisted backward-coupler, mounted on said first surface of said substrate and optically coupled to each of said plurality of single mode waveguides; and

(d) a plurality of digital optical switches, each having a plurality of output waveguides, optically coupled with said plurality of multi-mode waveguides.